

Claims

- 5 1. Apparatus (1; 51; 101; 101') for cleaning air, the apparatus (1; 51; 101; 101') comprising a chamber (2; 52; 102; 102') having an inlet (IL) and an outlet (OL), through which air to be cleaned is passable, a plurality of UV light sources (7; 54; 104; 204) to irradiate the interior of the chamber (2; 52; 102; 102') and one or more UV transmissible shield members (3, 4; 53; 103; 103')

10 isolating the UV light sources (7; 54; 104; 204), in use, from the air to be cleaned and characterised in that at least some of the UV light sources (7; 54; 104; 204) are mounted on a common mounting means such that said some of the UV light sources (7; 54; 104; 204) are removable together from the apparatus (1; 51; 101; 101').

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2. Apparatus (1; 51; 101; 101') according to Claim 1, further comprising filter means (9; 55; 105; 105') upstream of said UV light sources (7; 54; 104; 204).
3. Apparatus (1; 51; 101; 101') for cleaning air, the apparatus (1; 51; 101; 101') comprising a chamber (2; 52; 102; 102') having an inlet (IL) and an outlet (OL), through which air to be cleaned is passable, one or more UV light sources (7; 54; 104; 204) to irradiate the interior of the chamber (2; 52; 102; 102') and one or more UV transmissible shield members (3, 4; 53) isolating the UV light sources (7; 54; 104; 204), in use, from the air to be cleaned and

20 filter means (9; 55; 105; 105') upstream of the or each UV light source (7; 54; 104; 204), and characterised in that upstream of said filter means (9; 55; 105; 105') is located air flow equalising means (10) which, in use, ensures that the

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flow of air through said filter means (9; 55; 105; 105') is substantially constant across the area of said filter means (9; 55; 105; 105').

5 4. Apparatus (1; 51; 101; 101') according to Claim 3, wherein at least the downstream surface of said air flow equalising means (10) is at least partially UV reflective.

10 5. Apparatus (1; 51; 101; 101') for cleaning air, the apparatus (1; 51; 101; 101') comprising a chamber (2; 52; 102; 102') having an inlet (IL) and an outlet (OL), through which air to be cleaned is passable, one or more UV light sources (7; 54; 104; 204) to irradiate the interior of the chamber (2; 52; 102; 102') and one or more UV transmissible shield members (3, 4; 53; 103; 103') isolating the UV light sources (7; 54; 104; 204), in use, from the air to be cleaned and filter means (9; 55; 105; 105') upstream of the or each UV light source (7; 54; 104; 204), and characterised in that upstream of said filter means (9; 55; 105; 105') is located a UV reflector (10) arranged to allow air to flow therethrough but to prevent UV light from passing therethrough at least a portion of incidental UV light being reflected towards said filter means (9; 55; 105; 105').

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6. Apparatus (1; 51; 101; 101') according to Claim 5, wherein the UV reflector (10) forms part of air flow equalising means which, in use, ensures that the flow of air through said filter means (9; 55; 105; 105') is substantially constant across the area of said filter means (9; 55; 105; 105').

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7. Apparatus (1; 51; 101; 101') according to Claim 3, 4 or 6, wherein said air flow equalising means (10) comprises a plurality of angled air flow paths.
8. Apparatus (1; 51; 101; 101') according to Claim 7, wherein the angle of the air flow paths is about 45° to the major flow axis of air passing through the apparatus (1; 51; 101; 101').
9. Apparatus (1; 51; 101; 101') according to any of Claims 3, 4 or 6 to 8, wherein said air flow equalising means (10) comprises a plural-layered structure each layer comprising a plurality of angled flow paths.
10. Apparatus (1; 51; 101; 101') according to Claim 9, wherein the flow paths of adjacent layers of said air flow equalising means (10) are not parallel to encourage, in use, air flowing therethrough to adopt a tortuous flow path.
11. Apparatus (1; 51; 101; 101') according to any preceding Claim, wherein the UV transmissible shield member or members (3, 4; 53; 103; 103') is/are formed from quartz, fused silica, UV transmissible plastics or other suitable materials.
12. Apparatus (1; 51; 101; 101') according to any preceding Claim, wherein the or each UV light source (7; 54; 104; 204) is a UV lamp, emitting light in the UV-C band (typically 254 nm).

13. Apparatus (1; 51; 101; 101') according to any preceding Claim, wherein the or each UV light source (7; 54; 104) is of non-circular cross-sectional shape, say oval with flats.

5 14. Apparatus (1; 51; 101; 101') according to any preceding Claim, wherein, in use, the mean level of radiation in the chamber (2; 52; 102; 102') is above 10 mW cm⁻².

15. Apparatus (1; 51; 101; 101') according to Claim 14, wherein, in use, the mean
10 level of radiation in the chamber (2; 52; 102; 102') is at or above 60 mWcm⁻².

16. Apparatus (1; 51; 101; 101') according to any preceding Claim, wherein the UV transmissible shield member (3, 4; 53; 103; 103') provides at least part of a boundary defining the flow path of the air to be cleaned.

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17. Apparatus (101; 101') according to Claim 16, wherein the UV transmissible shield member (103; 103') is a tube mounted within the chamber, the air to be cleaned being flowable thorough the tubular shield member (103; 103'), the UV light sources (104; 204) being located between the chamber wall and the
20 shield member (103; 103').

18. Apparatus (1) according to Claim 16, wherein the UV transmissible shield member (3, 4) provides at least one wall of the chamber (2), the or each UV light source (7) being located outside of the to-be-cleaned air flow path.

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19. Apparatus (1) according to Claim 18, wherein the or each UV light source (7) is located adjacent a UV reflective surface (8) to reflect impinging UV radiation into the chamber (2).
- 5 20. Apparatus (51) according to any of Claims 1 to 15, wherein the UV transmissible shield member(s) (53) comprises one or more tubes (53) which extend across the chamber, a UV light source (54) being mounted within the or each tubular UV transmissible shield members (53).
- 10 21. Apparatus (1; 51; 101; 101') according to any preceding Claim, wherein the chamber (2; 52; 102; 102') comprises one or more walls (520, 521, 522, 523; 123; 123') which comprise a UV reflective surface.
- 15 22. Apparatus (51; 101; 101') according to Claim 20, wherein said one or more walls comprising (520, 521; 123; 123') a UV reflective surface may be shaped to present a concave surface as viewed from the major axis of the flowing air.
- 20 23. Apparatus (1; 51; 101; 101') according to any preceding Claim, further comprising filter means (12; 56; 106; 106') situated across the outlet.
24. Apparatus (1; 51; 101; 101') according to Claim 22, wherein said outlet filter means (12; 56; 106; 106') comprises a HEPA filter element.
- 25 25. Apparatus (1; 51; 101; 101') according to Claim 23 or 24, wherein said outlet filter means (12; 56; 106; 106') comprises a combustible frame (561; 162; 162'), such as one fabricated from wood, a derivative of wood or the like.

26. Apparatus (1; 51; 101; 101') according to any of Claims 2 to 25, wherein said upstream, inlet filter means (9; 55; 105; 105') is fabricated from a UV transmissible material.

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27. Apparatus (1; 51; 101; 101') according to any of Claims 2 to 26, wherein said upstream, inlet filter means (9; 55; 105; 105') is coated and/or impregnated with an antimicrobial or biostatic substance.

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28. Apparatus (1; 51; 101; 101') according to any preceding Claim, further comprising a component made of a material which releases hydroxyl radicals.

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29. Apparatus (1; 51; 101; 101') according to any preceding Claim, comprising a plurality of UV light sources (7; 54; 104; 204), one power supply being present for each pair of UV light sources (7; 54; 104; 204).

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30. Apparatus (1; 51; 101; 101') according to Claim 29, wherein the or each power supply is tunable to deliver less or more power to the UV light sources (7; 54; 104; 204) to which it is connected.

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31. Apparatus (1; 51; 101; 101') according to Claim 29 or 30, further comprising UV monitoring means arranged to control the or each power supply to increase or decrease the power supplied, thereby ensuring that the UV irradiation within the chamber (2; 52; 102; 102') is monitored and/or kept within tolerable limits.

32. Apparatus (1; 51; 101; 101') for cleaning air, the apparatus (1; 51; 101; 101') comprising a chamber (2; 52; 102; 102'), having an inlet (IL) and an outlet (OL), through which air to be cleaned is passable, a plurality of UV light sources (7) to irradiate the interior of the chamber (2; 52; 102; 102') and one
5 or more UV transmissible shield members (3, 4; 53; 103; 103') isolating the UV light sources (7; 54; 104; 204), in use, from the air to be cleaned and characterised in that two or more UV light sources (7; 54; 104; 204) are supplied with power from a tunable power source, said two or more UV light sources (7; 54; 104; 204) having UV monitoring means associated therewith,
10 said UV monitoring means being arranged in operative feedback control of the power source to ensure UV output from the UV light sources (7; 54; 104; 204) is within tolerable limits.

33. A portable air cleaning unit (200), the unit (200) comprising a housing in which
15 is located air cleaning apparatus (1; 51; 101; 101') according to any of Claims 1 to 32 and air movement means operable to cause air to flow from the inlet to the outlet of the air cleaning apparatus (1; 51; 101; 101').

34. A method of cleaning air, the method comprising moving air through air
20 cleaning apparatus as claimed in any of Claims 1 to 32 and expelling cleaned air.